

Visualization of NASA Earth Science Data in Google Earth

Aijun Chen^{a,b}, Gregory Leptoukh^b, Steven Kempler^b, Christopher Lynnes^b Liping Di^a

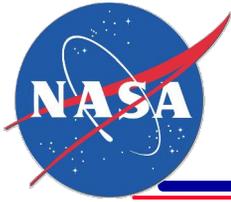
Goddard Earth Sciences Data and Information Services Center (GES DISC)
NASA Goddard Space Flight Center (GSFC), Greenbelt, MD 20771 USA

Dr. Aijun Chen

Aijun.Chen@nasa.gov

^aCenter for Spatial Information Science and Systems (CSISS)
George Mason University, 6301 Ivy Lane, Suite 620, Greenbelt MD 20770 USA

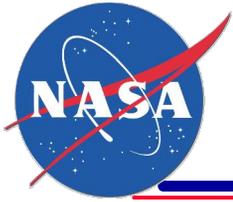
^bNASA/GSFC GES DISC



Outline



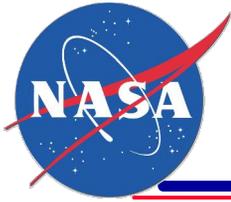
- ❖ Data/Services/Applications at Goddard Earth Sciences DISC
 - ❖ Data
 - ❖ Services and Tools
 - ❖ Applications
- ❖ Data organization in Google Earth
- ❖ 2D data process and visualization in Google Earth
- ❖ 3D data process and visualization in Google Earth
 - ❖ Giovanni version 3
 - ❖ COLLADA 3D model
 - ❖ Orbit curtain
- ❖ Discussion and conclusion



Outline



- ❖ Data/Services/Applications at Goddard Earth Sciences DISC
 - ❖ Data
 - ❖ Services and Tools
 - ❖ Applications
- ❖ Data organization in Google Earth
- ❖ 2D data process and visualization in Google Earth
- ❖ 3D data process and visualization in Google Earth
 - ❖ Giovanni version 3
 - ❖ COLLADA 3D model
 - ❖ Orbit curtain
- ❖ Discussion and conclusion



Data -- category in Earth measurements



visit: <http://disc.gsfc.nasa.gov>

❖ Atmospheric Composition

-- Ozone, Trace gases, Aerosols, Air quality

❖ A-Train Data Depot

-- OCO, Aqua, CloudSat, CALIPSO, Parosol,

❖ Hurricanes

-- TRMM, AIRS, MODIS, OMI

❖ Hydrology

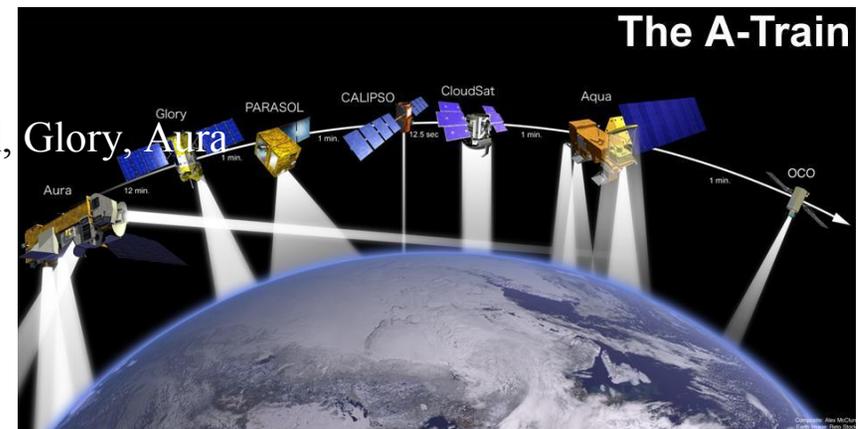
-- Data from GLDAS (Global Land Data Assimilation System), AIRS, TRMM

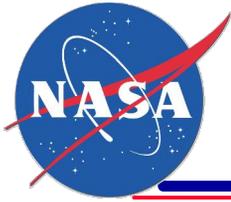
❖ Oceans

-- CZCS, OCTS, SeaWiFS, MODIS-Aqua & -Terra

❖ Precipitation

-- TRMM (three-hourly and monthly)



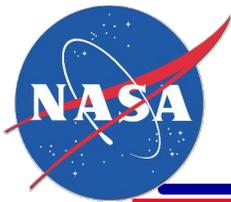


Data – category in missions



visit: <http://disc.gsfc.nasa.gov>

- ❖ TRMM (PR, TMI, VIRS)
- ❖ Terra (MODIS, ASTER)
- ❖ Aqua (AIRS, MODIS, AMSU-A, HSB)
- ❖ Aura (MLS, HIRDLS, OMI, TES)
- ❖ CloudSat
- ❖ CALIPSO
- ❖ Earth Probe (TOMS)
- ❖ Nimbus-7 (TOMS, LIMS,)
- ❖ UARS (CLAES, HALOE, HRDI, ISAMS, MLS, PEM)
- ❖ SORCE (TIM, SOLSTICE)
- ❖ NOAA POES (MSU)



Services & Tools at NASA GES DISC -1



visit: <http://disc.gsfc.nasa.gov>

❖ FTP – online data download

Provides most of data. Also, TRMM level 3 Gridded and AIRS level 3 version 5 with KMZ download.

❖ Mirador – online fast, simple retrieval

available data: AIRS, OMI, MLS, HIRDLS2, TOMS, TRMM, UARS, SORCE, and MODIS.

❖ GrADS Data Server (GDS)

Global Land Data Assimilation System (GLDAS) from models: CLM, MOSAIC, NOAH

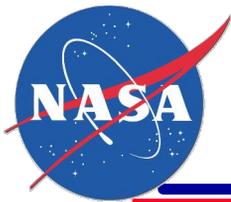
❖ OPeNDAP

AIRS/Aqua, MSU/POES(NOAA), TOMS, TRMM

❖ OGC WMS

TRMM, AIRS/Aqua, OMI (getCapabilities, getMap, getLegendGraphic)



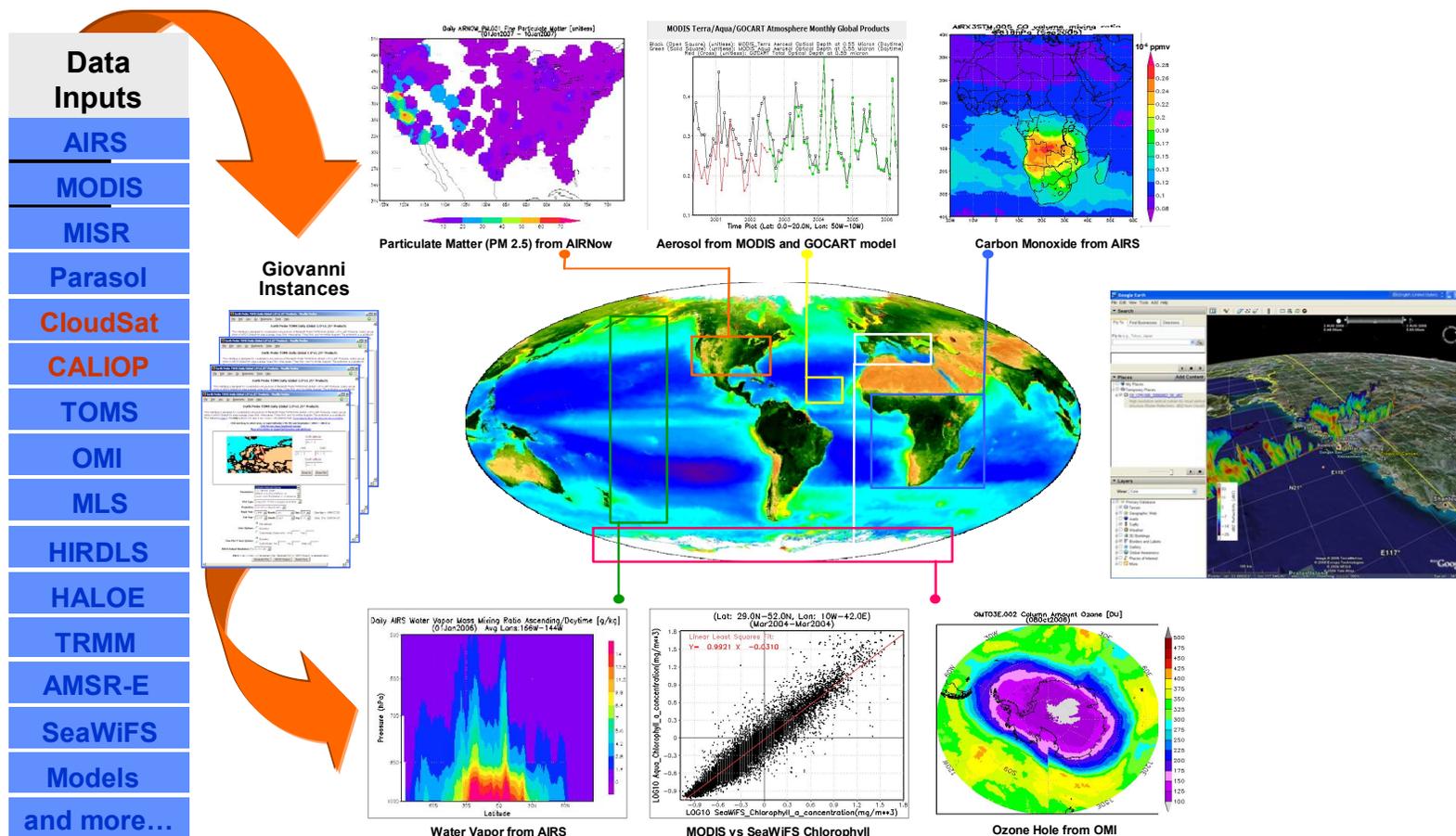


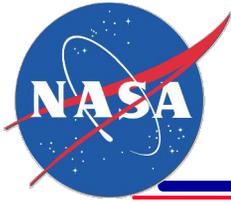
Services & Tools at NASA GES DISC -2



visit: <http://disc.gsfc.nasa.gov>

❖ GIOVANNI – online analysis and visualization





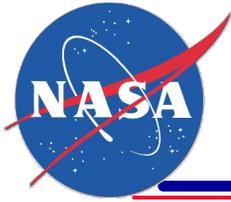
Services & Tools at NASA GES DISC -3



visit: <http://disc.gsfc.nasa.gov>

❖ Data Tools

- HDFView -- browse and edit the hdf4 and hdf5 files (Java)
- HDFLook – process and visualize MODIS and AIRS L1B (C)
- SIMAP – a simple MODIS and AIRS mapper (IDL)
- SeaDAS – SeaWiFS Data Analysis System for ocean color data (C, Fortran)
- Aura & TOMS read software (C, IDL)
- TRMM read software (C)
- UARS read software (C, Fortran)
- h5dump – examine the contents of an hdf5 file and dump those contents (C)
- hdp -- a command line utility for displaying contents and data of HDF objects. (C)
- READ_HDF – read hdf4 (C)
- READ_H5 – read hdf5 (C)



Applications at NASA GES DISC



visit: <http://disc.gsfc.nasa.gov>

❖ G3 NEESPI (Land Surface and Atmosphere) (**Data:** MODIS, NESDIS/IMS)

fire detection, snow and ice occurrence frequency, temperature, EVI, NDVI, soil moisture, aerosol, cloud fraction, cloud top pressure, H₂O

❖ G3 A-Train (**Data:** CloudSat, CALIPSO, AIRS, MODIS)

cloud, atmospheric temperature, H₂O, cloud/aerosol classification, water

❖ G3 Air Quality (**Data:** MODIS, OMI/Aura)

Aerosol (absorption, extinction) optical depth, cloud optical depth, cloud top pressure, ...

❖ G3 TOVAS (TRMM Online Visualization and Analysis System) (**Data:** TRMM)

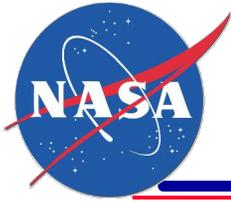
Rain rate, cloud ice/water, precipitation ice/water, ...

❖ G3 Ozone (**Data:** OMI/Aura)

Column amount ozone, aerosol absorption/extinction optical depth

❖ G3 Ocean (**Data:** SeaWiFS, MODIS-Terra/Aqua)

Chlorophyll a concentration, diffuse attenuation coefficient, ...



Data organization in Google Earth



❖ KML 2.2

-- Specifies a set of elements to organize, store and express geospatial data in Google Earth, such as Document, Folder, Placemark, Icon, LineString, LinearRing, Polygon, MultiGeometry, 3D Models, GroundOverlay, ScreenOverlay, NetworkLink, TimeSpan, TimeStamp, and Textual descriptions.

❖ Geospatial data value

-- by using <Point>, <LineString>, <LinearRing>, <Polygon>, <MultiGeometry>

```
<LinearRing>
<coordinates>
-122.366278,37.818844,30
-122.365248,37.819267,30
-122.365640,37.819861,30
-122.366669,37.819429,30
-122.366278,37.818844,30
</coordinates>
</LinearRing>
```

❖ Geospatial images

-- by using <PhotoOverlay>, <ScreenOverlay>, and <GroundOverlay>

```
<GroundOverlay>
.....
<Icon>
<href>legend_calipso.png</href>
</Icon>
</ GroundOverlay >
```

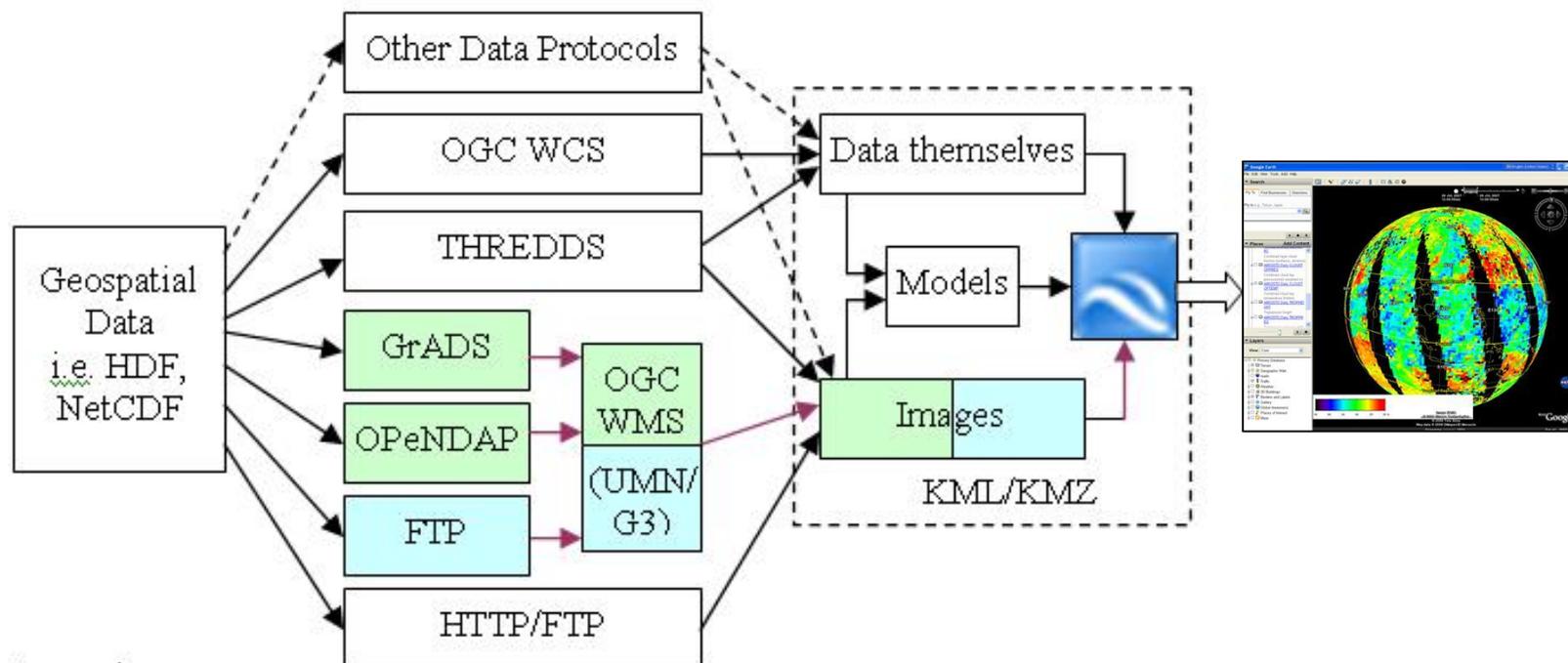
❖ 3D models

-- by using <Model>

```
<Model>
.....
<Link>
<href>models/2008-02-11_001.dae</href>
</Link>
</Model>
```



2D data processing and visualization



Legends

HDF: Hierarchical Data Format

OGC: Open Geospatial Consortium

GrADS: Grid Analysis and Display System

THREDDS: Thematic Real-time Environmental Distributed Data Services

OPeNDAP: Open-source Project for a Network Data Access Protocol

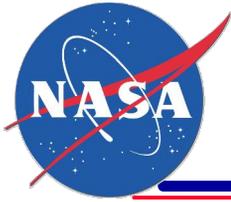
HTTP: Hypertext Transfer Protocol

NetCDF: network Common Data Format

WCS: Web Coverage Service

WMS: Web Map Service

FTP: File Transfer Protocol



Data access via OPeNDAP and UMN WMS



<GroundOverlay>

<name>TOTCLDLIQH2O_A</name>

<visibility>0</visibility>

<Icon>

<href> <![CDATA[http://g0hep12u.ecs.nasa.gov/mapserv-bin/wms_ogc?version=1.1.1&service=wms&request=Getmap&srs=EPSG:4326&layers=AIRX3STM_TOTCLDLIQH2O_A&BBOX=-180,-89,180,89&format=image/gif&transparent=true&width=1500&height=1000&time=2007-09-01]]> </href>

</Icon>

<LatLonBox>

<north>89</north>

<south>-89</south>

<east>180</east>

<west>-180</west>

</LatLonBox>

<TimeStamp>

<when>2007-09-01</when>

</TimeStamp>

</GroundOverlay>

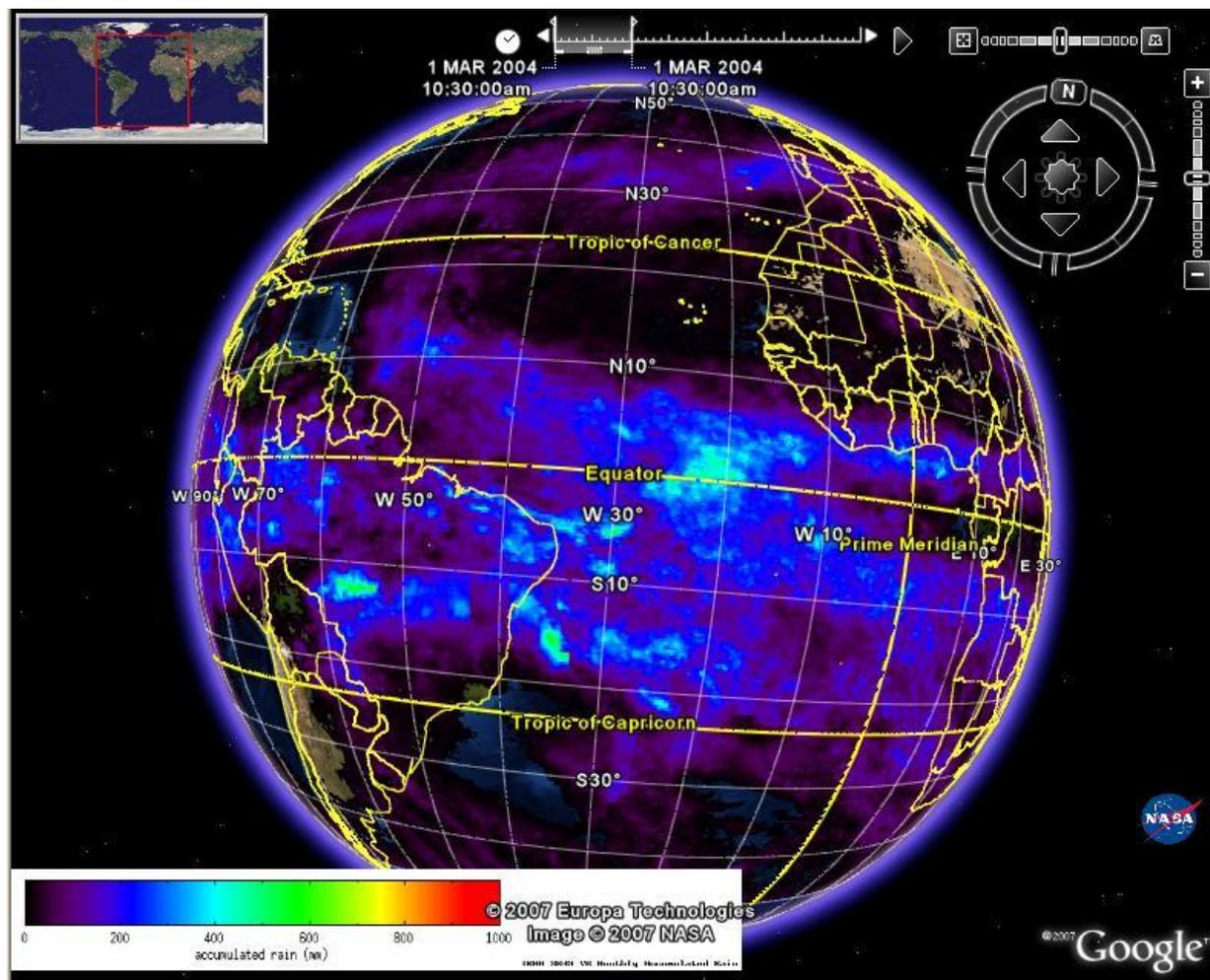


2D TRMM data in GE -1



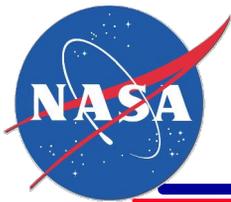
❖ TRMM Level 3 Gridded

http://disc.gsfc.nasa.gov/data/datapool/TRMM/01_Data_Products/02_Gridded/index.html



2004-03-01:

3B43: Monthly $0.25^\circ \times 0.25^\circ$ merged TRMM and other sources estimates

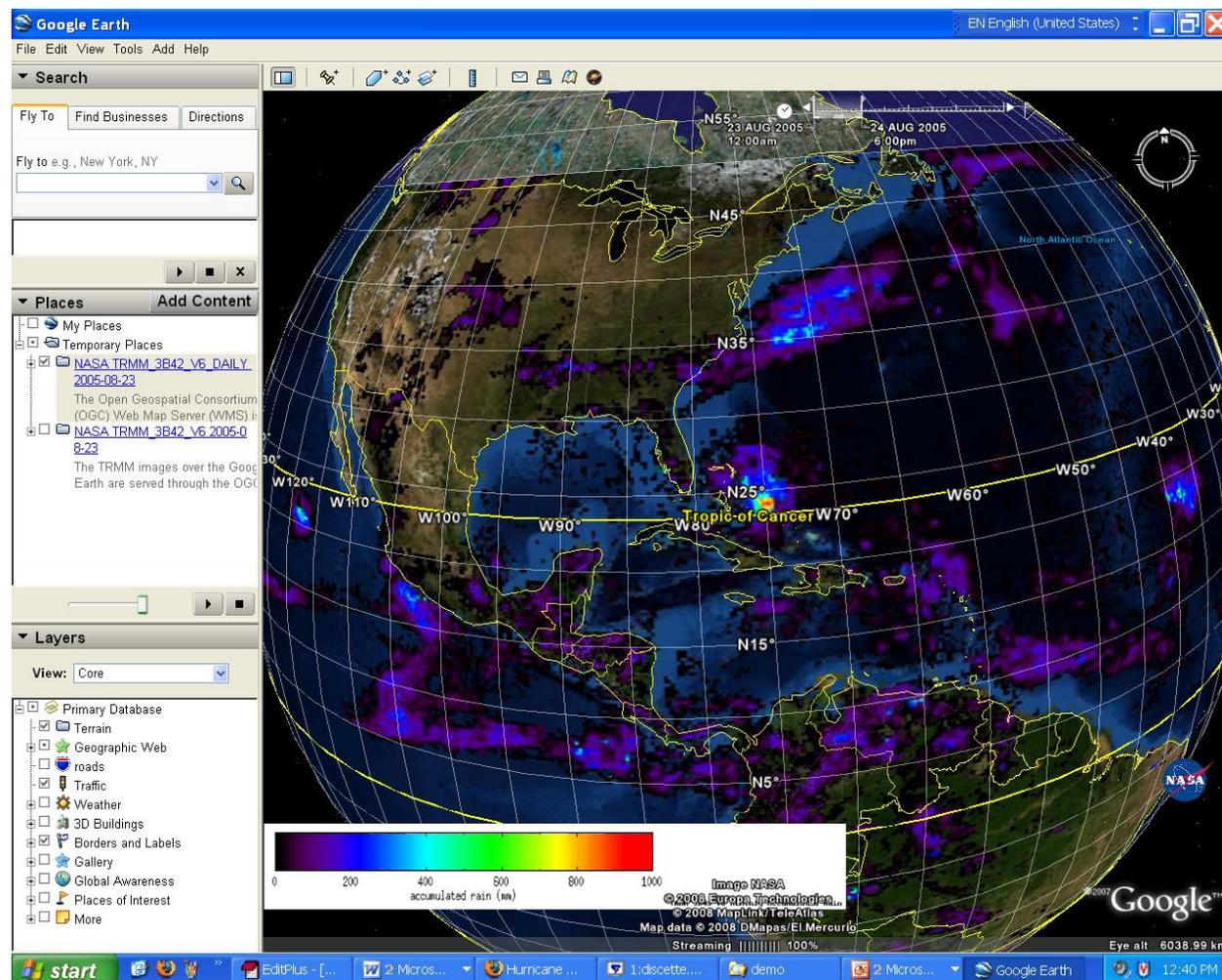


2D TRMM data in GE -2



❖ Hurricane Katrina

<http://disc.sci.gsfc.nasa.gov/hurricane/>



2005-08-23

12:00:00

Hurricane Katrina

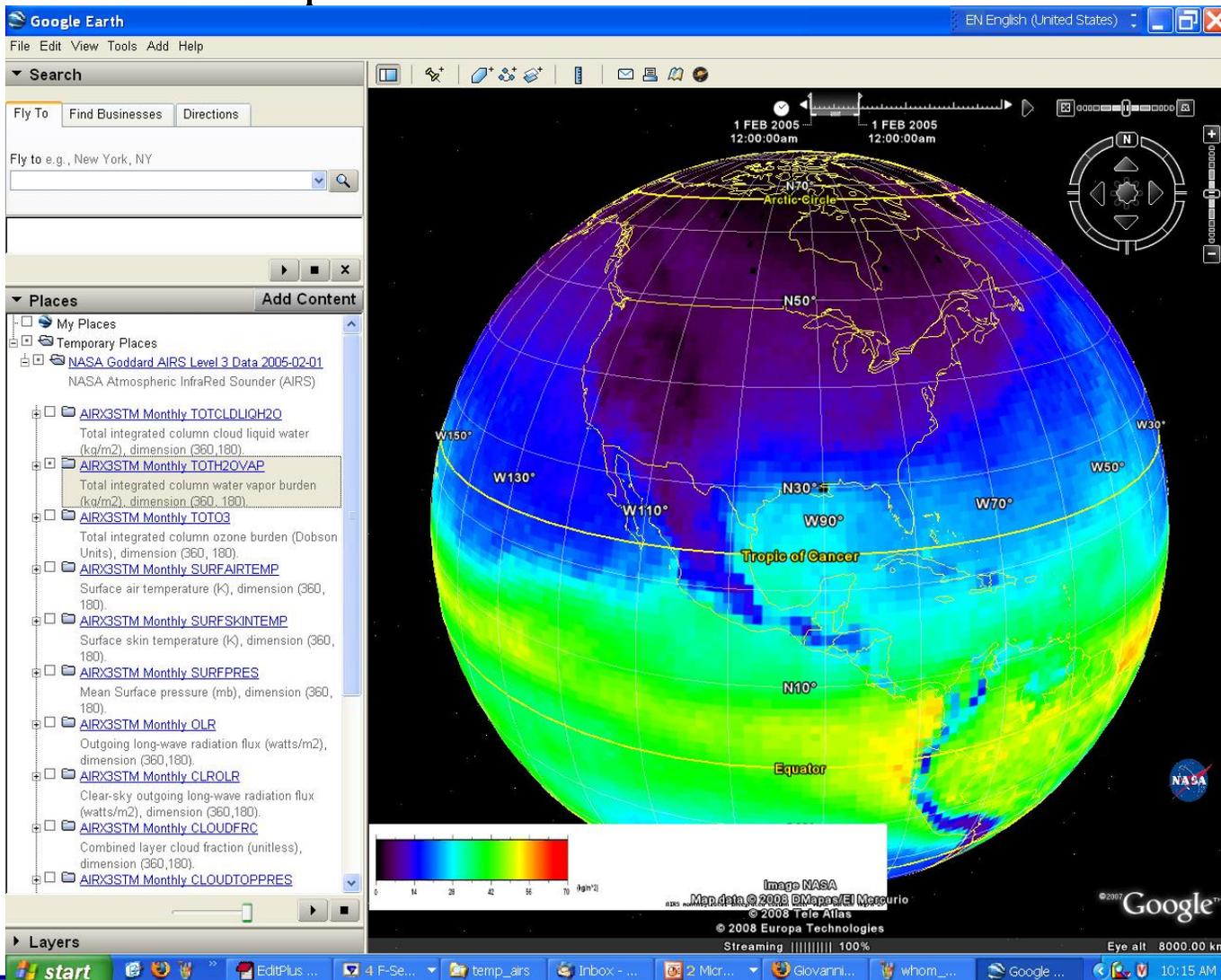
3B42 3-hourly 0.25°
x 0.25° TRMM
precipitation data



2D AIRS/Aqua data in GE



❖ AIRS/Aqua http://disc.sci.gsfc.nasa.gov/data/datapool/AIRS/Level3_V005/index.html



2005-02

Monthly total integrated column water vapor burden (kg/m²), dimension (360, 180).

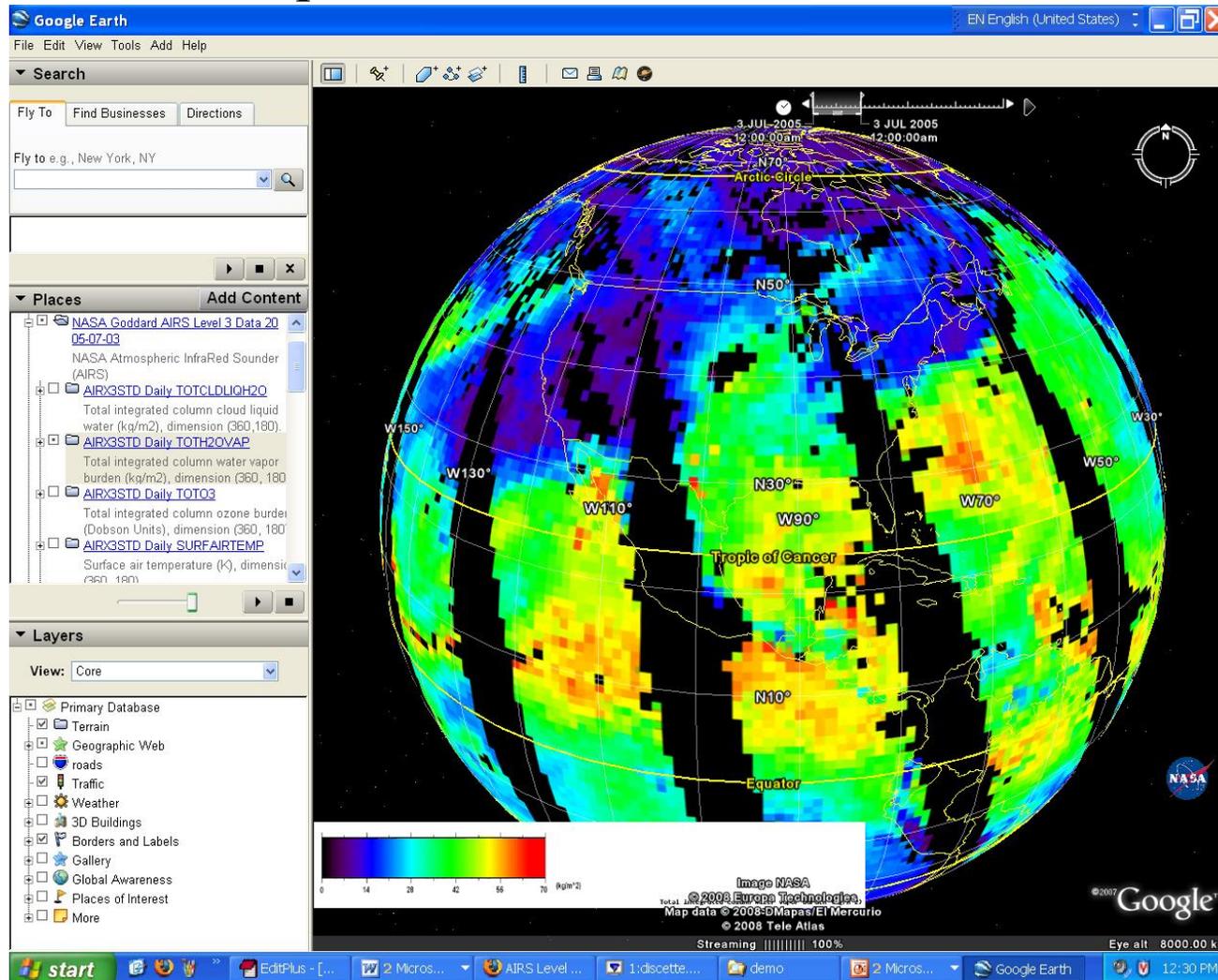
NASA/GMU CSISS



2D AIRS/Aqua data in GE



❖ AIRS/Aqua http://disc.sci.gsfc.nasa.gov/data/datapool/AIRS/Level3_V005/index.html



2005-07-03

Daily total integrated column water vapor burden (kg/m²), dimension (360, 180).



TRMM KMZ in WHOM



http://disc.gsfc.nasa.gov/data/datapool/TRMM/01_Data_Products/02_Gridded/index.html



Monthly 0.25° x 0.25° TRMM and Other Sources Rainfall for 2007

- **SINGLE FULL SIZE** granule download: click on the corresponding "Data File".
- **MULTIPLE FULL SIZE** granule download:
 - Click the "Batch Download Script for FULL SIZE granules" link provided below the table of granules.
 - Create a new text file 'script.txt' and paste the commands found on the batch file script page.
 - On SGI or Linux machine, run: `ftp -p -n disc2.nascom.nasa.gov < script.txt`
 - On DOS, SunOS or Windows/Mac platforms, run: `ftp -n disc2.nascom.nasa.gov < script`

Preview a [sample image](#)

Data File	XML File	KMZ File	Begin Date	End Date	Version	Item Size (KB)	Sample Image
3B43.070101.6.HDF	.xml	KMZ	2007-01-01 00:00:00	2007-02-01 00:00:00	006	4523	Preview
3B43.070201.6.HDF	.xml	KMZ	2007-02-01 00:00:00	2007-03-01 00:00:00	006	4523	Preview
3B43.070301.6.HDF	.xml	KMZ	2007-03-01 00:00:00	2007-04-01 00:00:00	006	4523	Preview
3B43.070401.6.HDF	.xml	KMZ	2007-04-01 00:00:00	2007-05-01 00:00:00	006	4523	Preview
3B43.070501.6.HDF	.xml	KMZ	2007-05-01 00:00:00	2007-06-01 00:00:00	006	4523	Preview
3B43.070501.6A.HDF	.xml	KMZ	2007-05-01 00:00:00	2007-06-01 00:00:00	006	4523	Preview
3B43.070601.6A.HDF	.xml	KMZ	2007-06-01 00:00:00	2007-07-01 00:00:00	006	4523	Preview
3B43.070701.6A.HDF	.xml	KMZ	2007-07-01 00:00:00	2007-08-01 00:00:00	006	4523	Preview
3B43.070801.6A.HDF	.xml	KMZ	2007-08-01 00:00:00	2007-09-01 00:00:00	006	4523	Preview
3B43.070901.6A.HDF	.xml	KMZ	2007-09-01 00:00:00	2007-10-01 00:00:00	006	4523	Preview
3B43.071001.6A.HDF	.xml	KMZ	2007-10-01 00:00:00	2007-11-01 00:00:00	006	4523	Preview
3B43.071101.6A.HDF	.xml	KMZ	2007-11-01 00:00:00	2007-12-01 00:00:00	006	4523	Preview
3B43.071201.6A.HDF	.xml	KMZ	2007-12-01 00:00:00	2008-01-01 00:00:00	006	4523	Preview

Batch Download Script (FULL SIZE granule DATA files): [3B43 data](#)
 Batch Download Script (METADATA files): [3B43 data](#)



AIRS KMZ in WHOM



http://disc.gsfc.nasa.gov/data/datapool/AIRS/Level3_V005/index.html

GES Distributed Active Archive Center

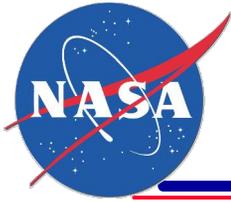
 **AIRS Level 3 Version 005 daily standard physical retrieval product for September, 2007**

S

- **SINGLE FULL SIZE** granule download: click on the corresponding "Data File".
- **MULTIPLE FULL SIZE** granule download: use [FTP script for Full Size granule DATA files](#).
On SGI or Linux platforms, run: ftp -p -n *machine* < script
On DOS, SunOS or Windows/Mac platforms, run: ftp -n -s *machine*:script
See [AIRS Data Access page](#) on which machine to use for the data type.

Data File	Metadata File	KMZ File	Begin Date	End Date	Collection	Item Size (KB)	S
AIRS.2007.09.01.L3.RetStd001.v5.0.14.0.G07248133737.hdf	.xml	KMZ	2007-09-01 00:00:00	2007-09-02 00:00:00	005	73325	
AIRS.2007.09.02.L3.RetStd001.v5.0.14.0.G07249012806.hdf	.xml	KMZ	2007-09-02 00:00:00	2007-09-03 00:00:00	005	73120	
AIRS.2007.09.03.L3.RetStd001.v5.0.14.0.G07333154022.hdf	.xml	KMZ	2007-09-03 00:00:00	2007-09-04 00:00:00	005	73095	
AIRS.2007.09.04.L3.RetStd001.v5.0.14.0.G07333162912.hdf	.xml	KMZ	2007-09-04 00:00:00	2007-09-05 00:00:00	005	72847	
AIRS.2007.09.05.L3.RetStd001.v5.0.14.0.G07250202117.hdf	.xml	KMZ	2007-09-05 00:00:00	2007-09-06 00:00:00	005	72986	
AIRS.2007.09.06.L3.RetStd001.v5.0.14.0.G07251152718.hdf	.xml	KMZ	2007-09-06 00:00:00	2007-09-07 00:00:00	005	72949	
AIRS.2007.09.07.L3.RetStd001.v5.0.14.0.G07252172903.hdf	.xml	KMZ	2007-09-07 00:00:00	2007-09-08 00:00:00	005	72721	
AIRS.2007.09.08.L3.RetStd001.v5.0.14.0.G07333155603.hdf	.xml	KMZ	2007-09-08 00:00:00	2007-09-09 00:00:00	005	72974	
AIRS.2007.09.09.L3.RetStd001.v5.0.14.0.G07334151328.hdf	.xml	KMZ	2007-09-09 00:00:00	2007-09-10 00:00:00	005	72761	
AIRS.2007.09.10.L3.RetStd001.v5.0.14.0.G07333123841.hdf	.xml	KMZ	2007-09-10 00:00:00	2007-09-11 00:00:00	005	73701	

Done



Data access via Giovanni WMS



<GroundOverlay>

<name>Daily MYD08_D3.005 Cloud_Top_Temperature_Day_Mean</name>

<visibility>1</visibility>

<Icon>

<href><![CDATA[<http://giovanniplus-ts1.sci.gsfc.nasa.gov/daac-bin/G3/giovanni-wmx.cgi?>

**SERVICE=WMS&WMTVER=1.0.0&REQUEST=GetMap&SRS=EPSG:4326&EXCEPTIONS=INIMAGE&LAYER
S=MYD08_D3.005::Cloud_Top_Temperature_Day_Mean:max=:min=&STYLES=latlonplot:top=surface:bottom=sur
face:ctype=predefined:palette=Rainbow&BBOX=-126.09375,23.90625,-65.15625,50.15625&TIME=2008-02-
28T00:00:00Z/2008-02-28T00:00:00Z&FORMAT=GIF&transparent=true&WIDTH=800&HEIGHT=400]]>**

</href>

</Icon>

<LatLonBox>

<north>50.15625</north>

<south>23.90625</south>

<east>-65.15625</east>

<west>-126.09375</west>

</LatLonBox>

<TimeStamp>

<when>2008-02-28T00:00:00Z</when>

</TimeStamp>

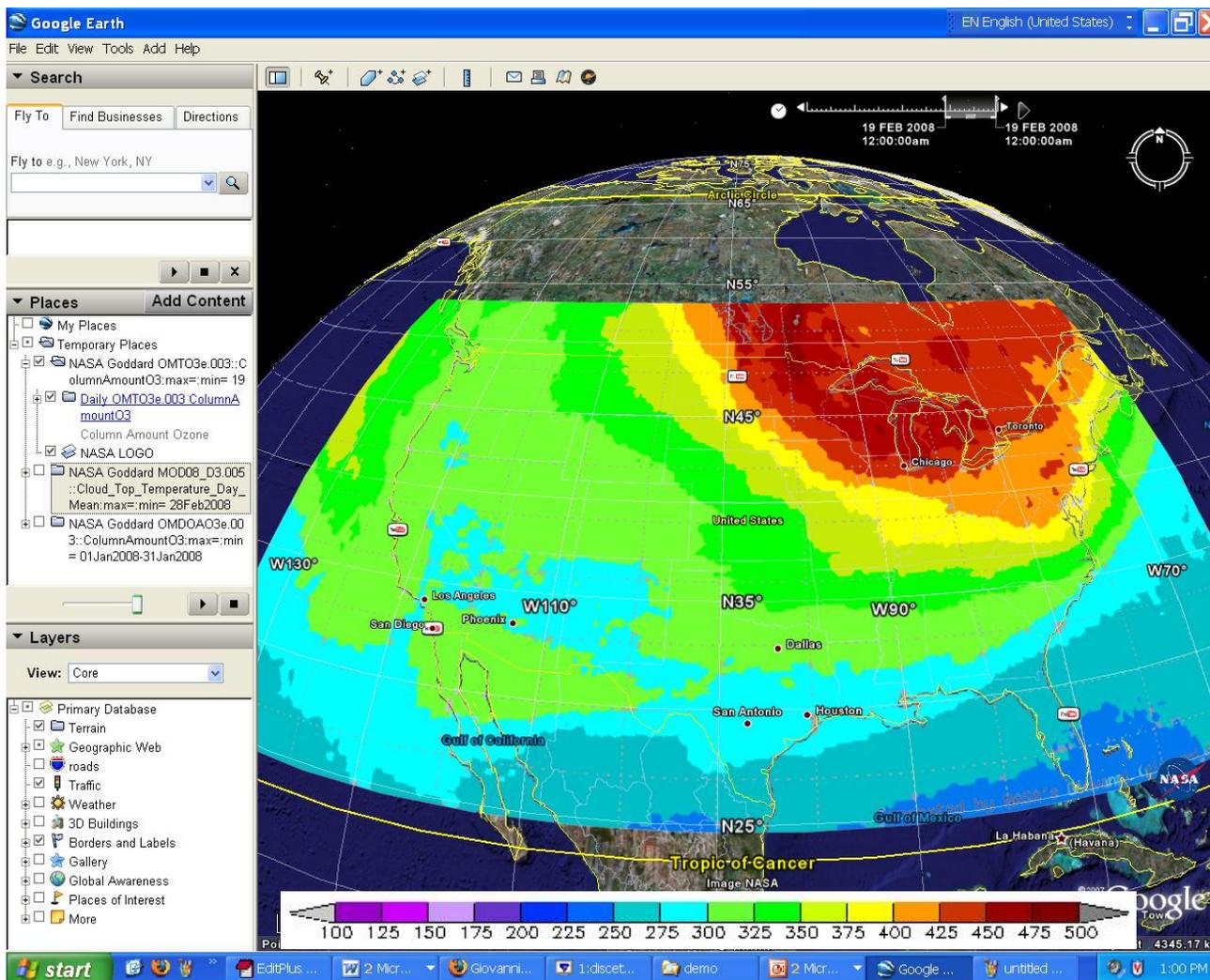
</GroundOverlay>



OMI/Aura data in GE

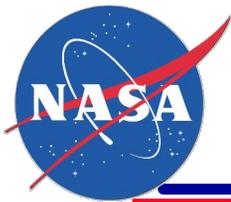


❖ OMI/Aura http://giovanniplus-ts1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=omi



2008-02-19

OMI/Aura daily
0.25° x 0.25°
Column Amount
Ozone based on the
TOMS algorithm
(OMTO3e) (Dobson
Unit)

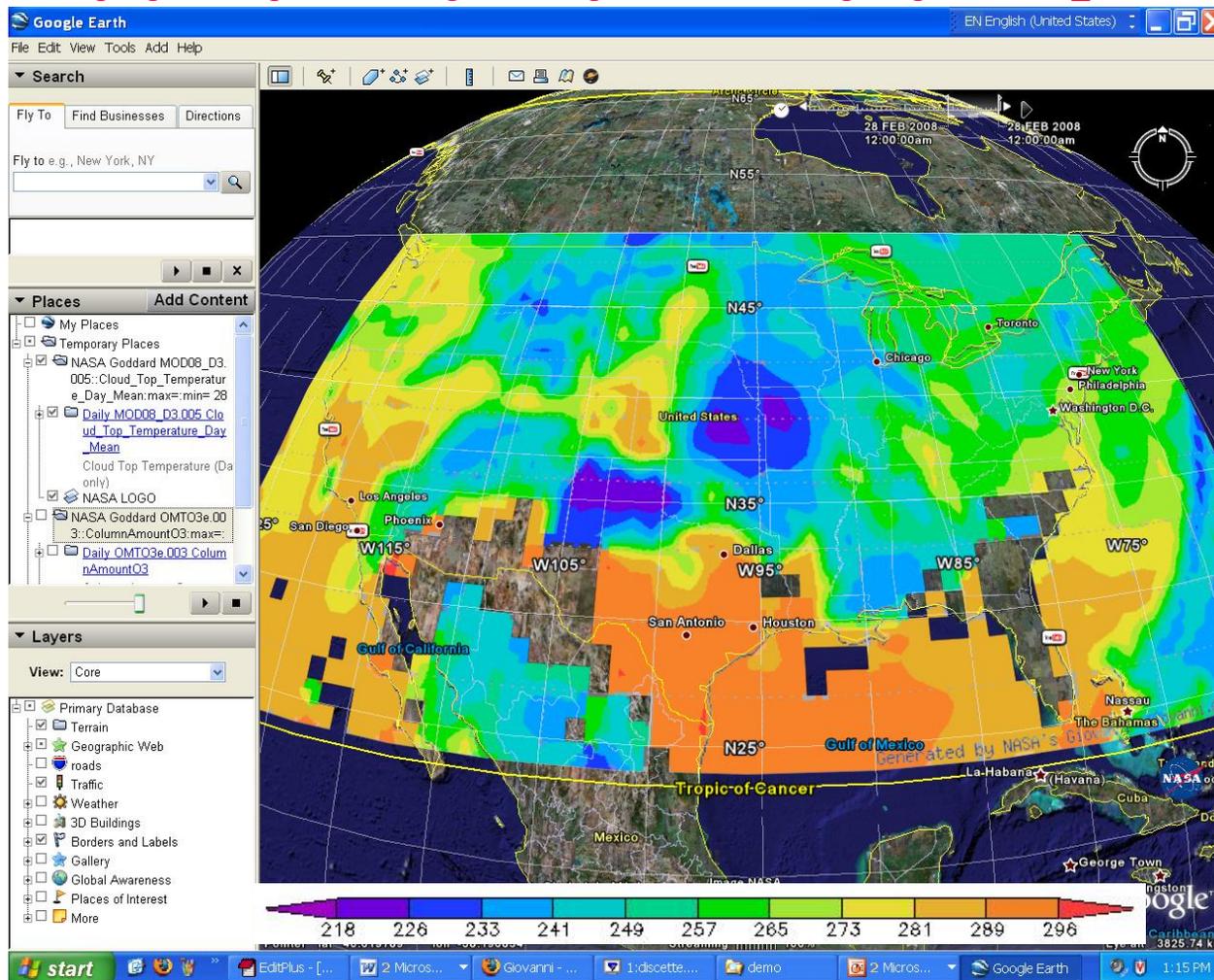


MODIS/Terra & Aqua data in GE



❖ MODIS/Terra & Aqua

http://giovanniplus-ts1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=MODIS_DAILY_L3



2008-02-28

MODIS/Terra daily
0.25° x 0.25° mean
Cloud top
Temperature

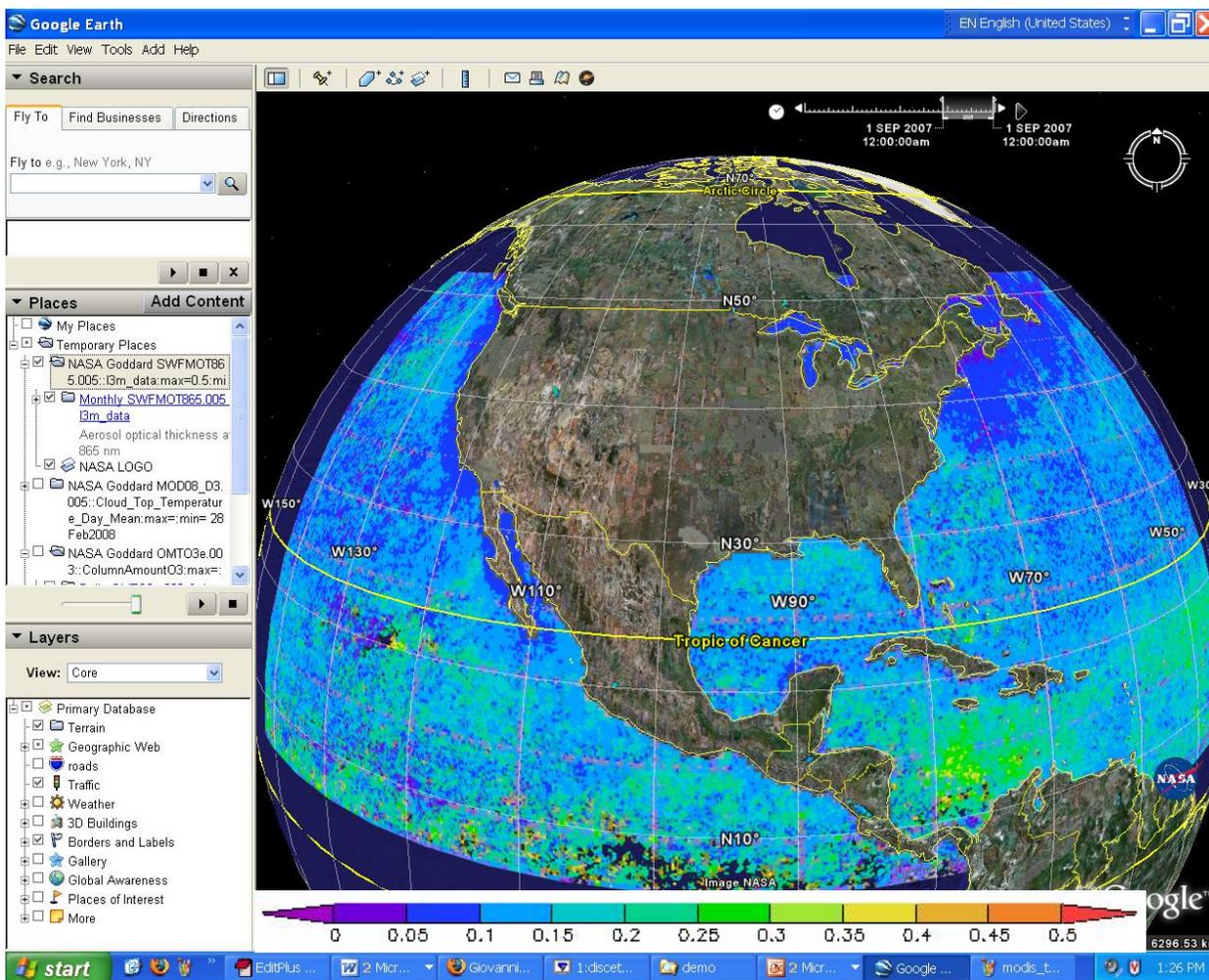


SeaWiFS data in GE



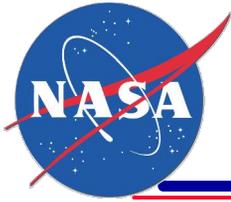
❖ SeaWiFS

http://giovanniplus-ts1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=ocean_month



2007-09

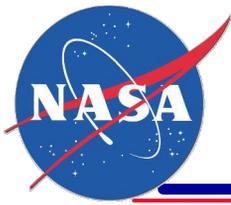
SeaWiFS ocean
aerosol optical
thickness at 865nm



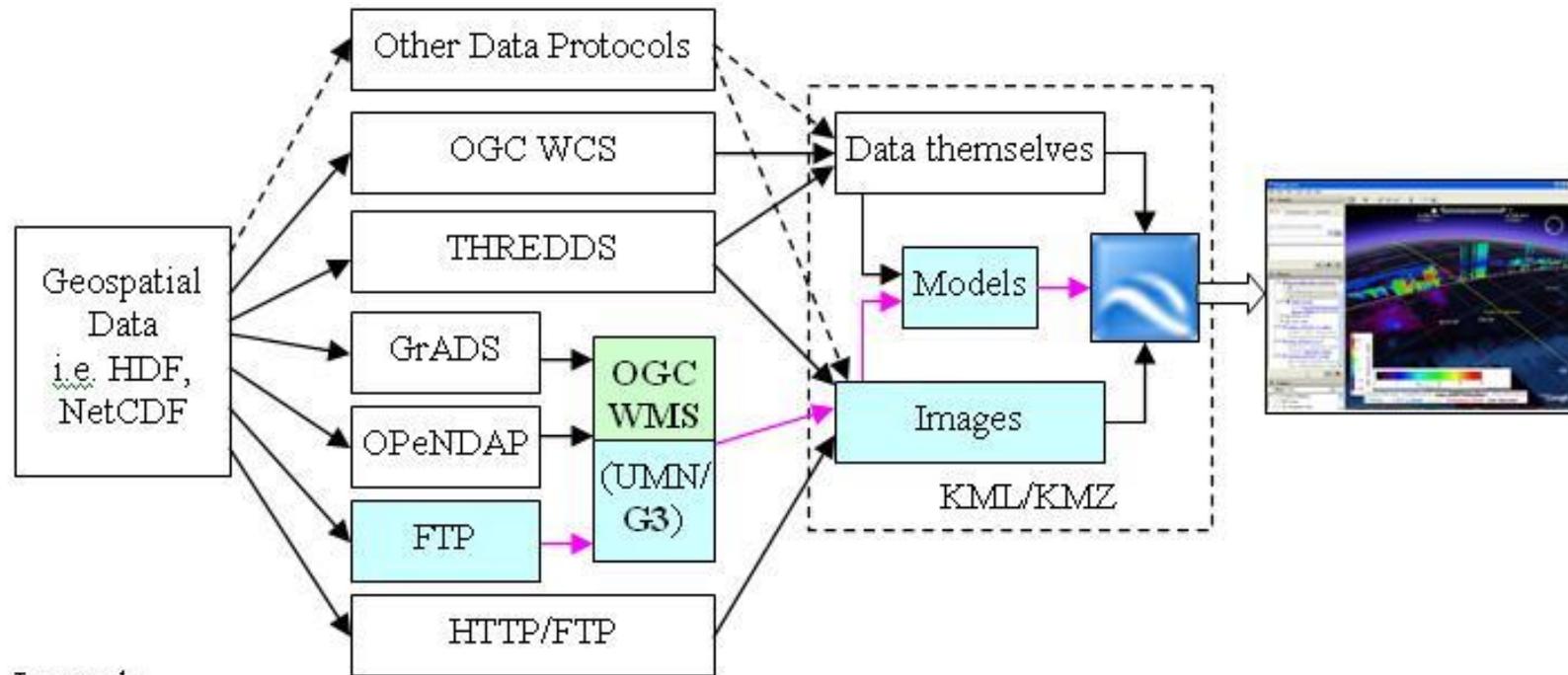
Rendering 3D data in GE - data



- ❖ CloudSat (1B_CPR.008)
 - ❖ ReceivedEchoPowers
 - ❖ Reflectivity dBZ
- ❖ CALIPSO (2B_CWC_RO.008)
 - ❖ RO Ice Water Content
 - ❖ RO Liquid Water Content
- ❖ AIRS (AIRX2RET.005)
 - ❖ Atmospheric Temperature Profile (3D)
 - ❖ H2O Saturation Mass Mixing Ratio (gm/kg dry air) (3D)
 - ❖ H2O Vapor Mass Mixing Ratio (gm/kg dry air) (3D)
- ❖ MODIS (MAC07S0.002)
 - ❖ Atmospheric Temperature Profile (Kelvins) (3D)
 - ❖ H2O (Dew_Point_Temperature_Profile in Kelvins) (3D)



Rendering 3D data in GE – Technical diagram



Legends

HDF: Hierarchical Data Format

NetCDF: network Common Data Format

OGC: Open Geospatial Consortium

WCS: Web Coverage Service

GrADS: Grid Analysis and Display System

WMS: Web Map Service

THREDDS: Thematic Real-time Environmental Distributed Data Services

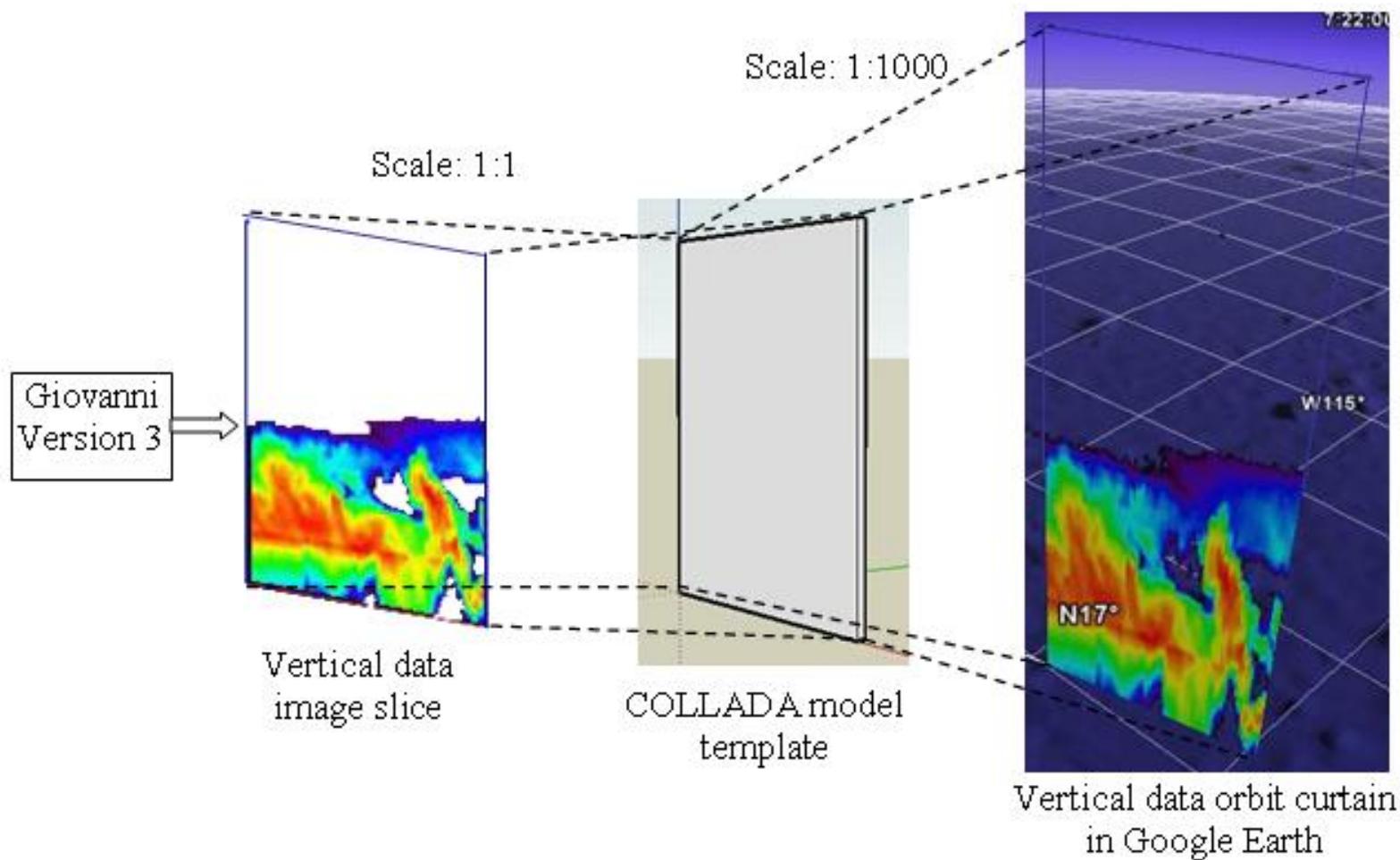
OPeNDAP: Open-source Project for a Network Data Access Protocol

HTTP: Hypertext Transfer Protocol

FTP: File Transfer Protocol



Render 3D data in GE -- Procedures





Giovanni v3 A-Train instance



Giovanni - A-Train Along CloudSat Track Instance - Mozilla Firefox EN English (United States)

File Edit View History Bookmarks Tools Help

http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=atrain kml 2.2

M Gmail - Inbox - ... Messenger Expr... noaa poes MSU ... Index of ftp://g... ftp://gio...7416.log Ticket 7629 - Ti... Giovanni - A-T...

A-Train Along CloudSat Track Instance

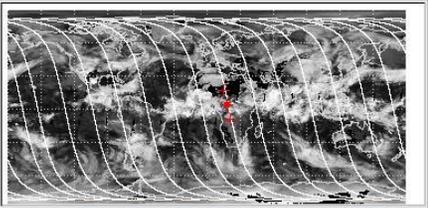
CloudSat, and coregistered MODIS/Aqua, AIRS/Aqua, CALIPSO lidar, and OMI/Aura Atmospheric Measurements

Plots of vertical profiles of clouds, temperature, humidity, cloud and aerosol classification; Horizontal swaths of cloud characteristics and total column aerosols, collocated with CloudSat track; Line over-plots of selected science parameters.

The A-Train Data Depot Project "Integrating Atmospheric Measurements along the A-Train Tracks Utilizing Data from the Aqua, CloudSat and CALIPSO Missions" is supported by NASA HQ through ROSES 2005 NNH05ZDA001N-ACCESS

Select Constraints:

Spatial



Map View: Ascending Orbits Range (kilometers) 3000

Temporal

Orbit Date Year 2008 Month Jun Day 4 Update Map (Range: 02 Jun 2006 - 07 Jun 2008)

Help with temporal availability.

Parameters

Curtains

<input type="checkbox"/> Temperature				
<input type="checkbox"/> Atmospheric Temperature Profile	AIRX2RET.005	AIRS Aqua	2002/08/30 - 2008/06/10	
<input type="checkbox"/> Atmospheric Temperature Profile (Kelvins)	MAC07S0.002	MODIS Aqua	2006/06/02 - 2008/06/10	
<input type="checkbox"/> Water Vapor				
<input type="checkbox"/> H2O Saturation Mass Mixing Ratio	AIRX2RET.005	AIRS Aqua	2002/08/30 - 2008/06/10	
<input type="checkbox"/> H2O Vapor Mass Mixing Ratio	AIRX2RET.005	AIRS Aqua	2002/08/30 - 2008/06/10	
<input type="checkbox"/> Retrieved Dew Point Temperature Profile	MAC07S0.002	MODIS Aqua	2006/06/02 - 2008/06/10	
<input type="checkbox"/> Clouds				
<input type="checkbox"/> Cloud/Aerosol Classification (Vertical Feature Mask)	VFM.002	Calipso - Lidar	2006/07/01 - 2008/06/03	
<input type="checkbox"/> Cloud Scenario	2B_CLDCLASS.009	CloudSat	2006/06/15 - 2008/06/02	
<input type="checkbox"/> ReceivedEchoPowers	1B_CPR.008	CloudSat	2006/06/02 - 2008/06/07	

Image loaded.

start 2 Microsoft... Giovanni - A-... 2 Microsoft... Inbox for aju... 2 F-Secure ... 0Tickets 3:51 PM

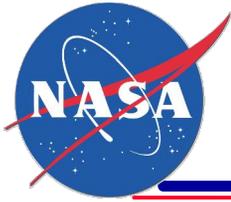
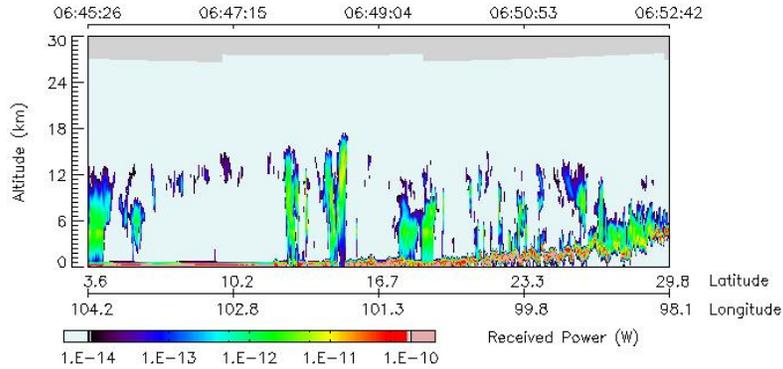


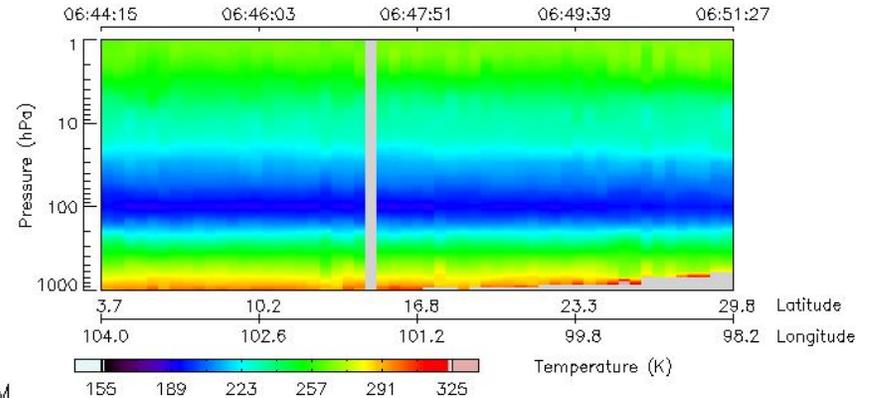
Image curtains of vertical profile from G3



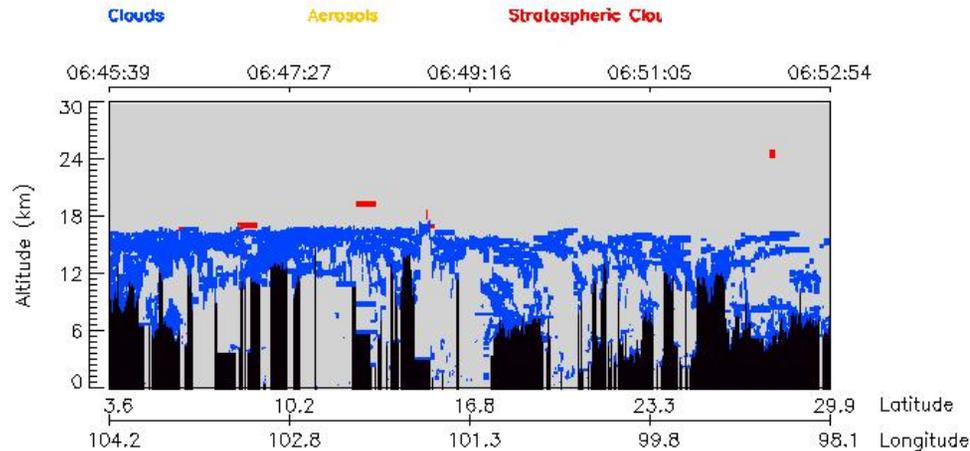
ReceivedEchoPowers (CloudSat)
17-Jun-2007 06:45:26 - 06:52:42 GMT



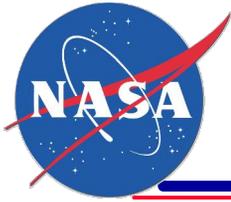
Atmospheric Temperature Profile (AIRS Aqua)
17-Jun-2007 06:44:15 - 06:51:27 GMT



Cloud/Aerosol Classification (Vertical Feature M)
17-Jun-2007 06:45:39 - 06:52:54



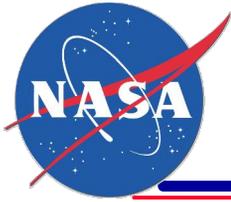
http://giovanniplus-ts1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=atrain



3D COLLADA model template



```
<?xml version="1.0" encoding="utf-8"?>
<COLLADA xmlns="http://www.collada.org/2005/11/COLLADASchema" version="1.4.1">
  <library_images>
    <image id="cloudsat_data-image" name="cloudsat_data-image">
      <init_from>../images/20060616_06_002.gif</init_from> </image>
    </library_images>
    .....
  <library_geometries>
    <geometry id="mesh1-geometry" name="mesh1-geometry">
      <mesh>
        <source id="mesh1-geometry-position">
          <float_array id="mesh1-geometry-position-array" count="12">0 0 0 109 0 0 -2.5 0 300 111.5 0 300</float_array>
        </source>
        .....
        <triangles material="cloudsat_data" count="4">
          <input semantic="VERTEX" source="#mesh1-geometry-vertex" offset="0"/>
          <input semantic="NORMAL" source="#mesh1-geometry-normal" offset="1"/>
          <input semantic="TEXCOORD" source="#mesh1-geometry-uv" offset="2" set="0"/>
          <p>0 0 0 1 0 1 2 0 2 0 1 0 2 1 2 1 1 1 3 0 3 2 0 2 1 0 1 3 1 3 1 1 1 2 1 2 </p>
        </triangles>
      </mesh>
    </geometry>
  </library_geometries>
  .....
</COLLADA>
```



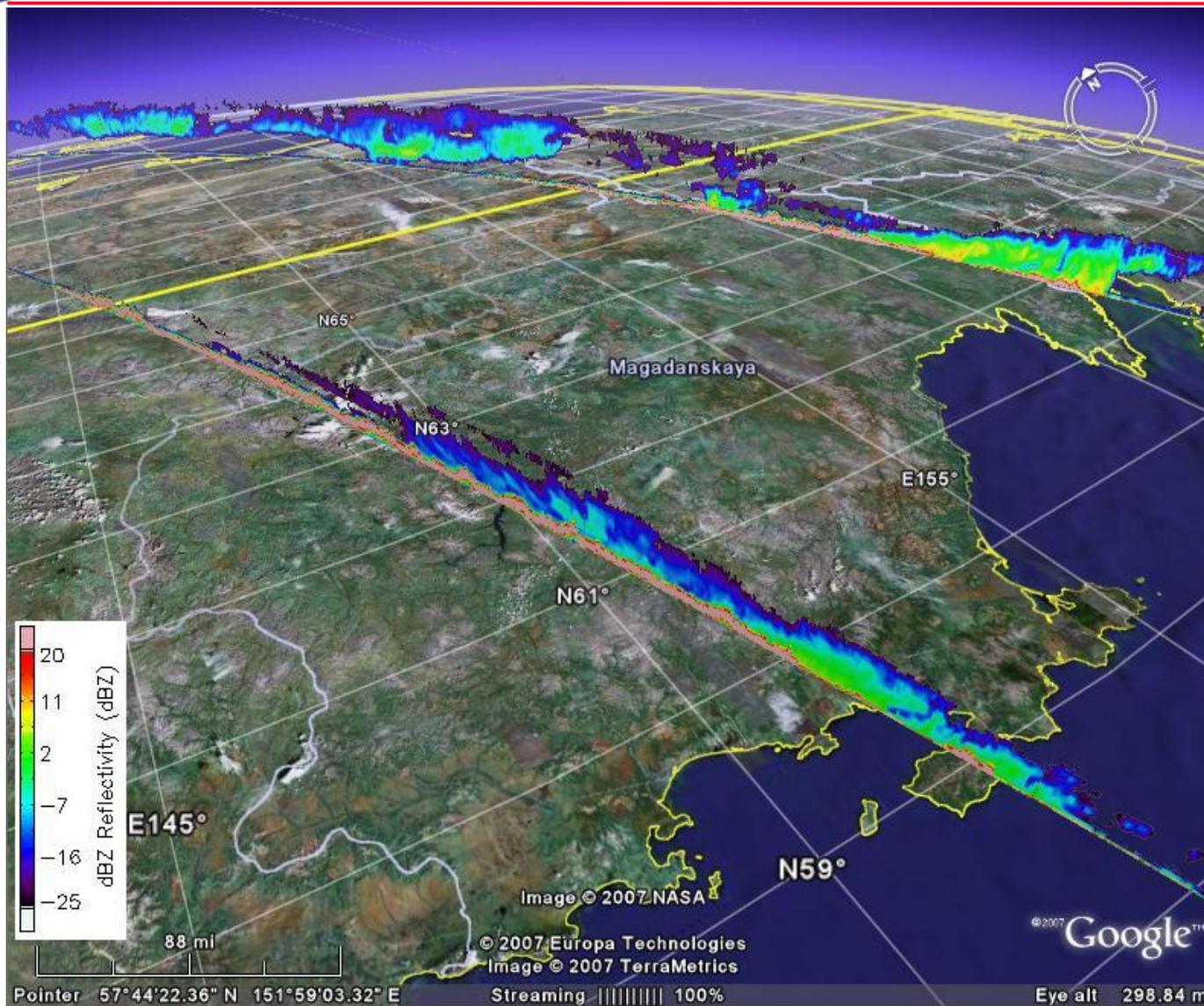
KML file for Vertical Curtain



```
<?xml version='1.0' encoding='UTF-8'?>
<kml xmlns='http://earth.google.com/kml/2.1'>
  <Folder> .....
    <Placemark>
      <name>HourSlice_20060616_06_002</name>
      <description><![CDATA[“curtain_slice_002”]]></description>
      <Style id='default'></Style>
      <Model>
        <altitudeMode>clampToGround</altitudeMode>
        <Location>
          <longitude> -86.15493800</longitude>
          <latitude> -68.71733900</latitude>
          <altitude>0.000000</altitude>
        </Location>
        <Orientation>
          <heading>114.38696591</heading> <tilt>0.000000</tilt> <roll>0.000000</roll>
        </Orientation>
        <Scale>
          <x>996</x> <y>1</y> <z>1000</z>
        </Scale>
        <Link>
          <href>models/20060616_06_002.dae</href>
        </Link>
      </Model> .....
    </Placemark></Folder></kml>
```



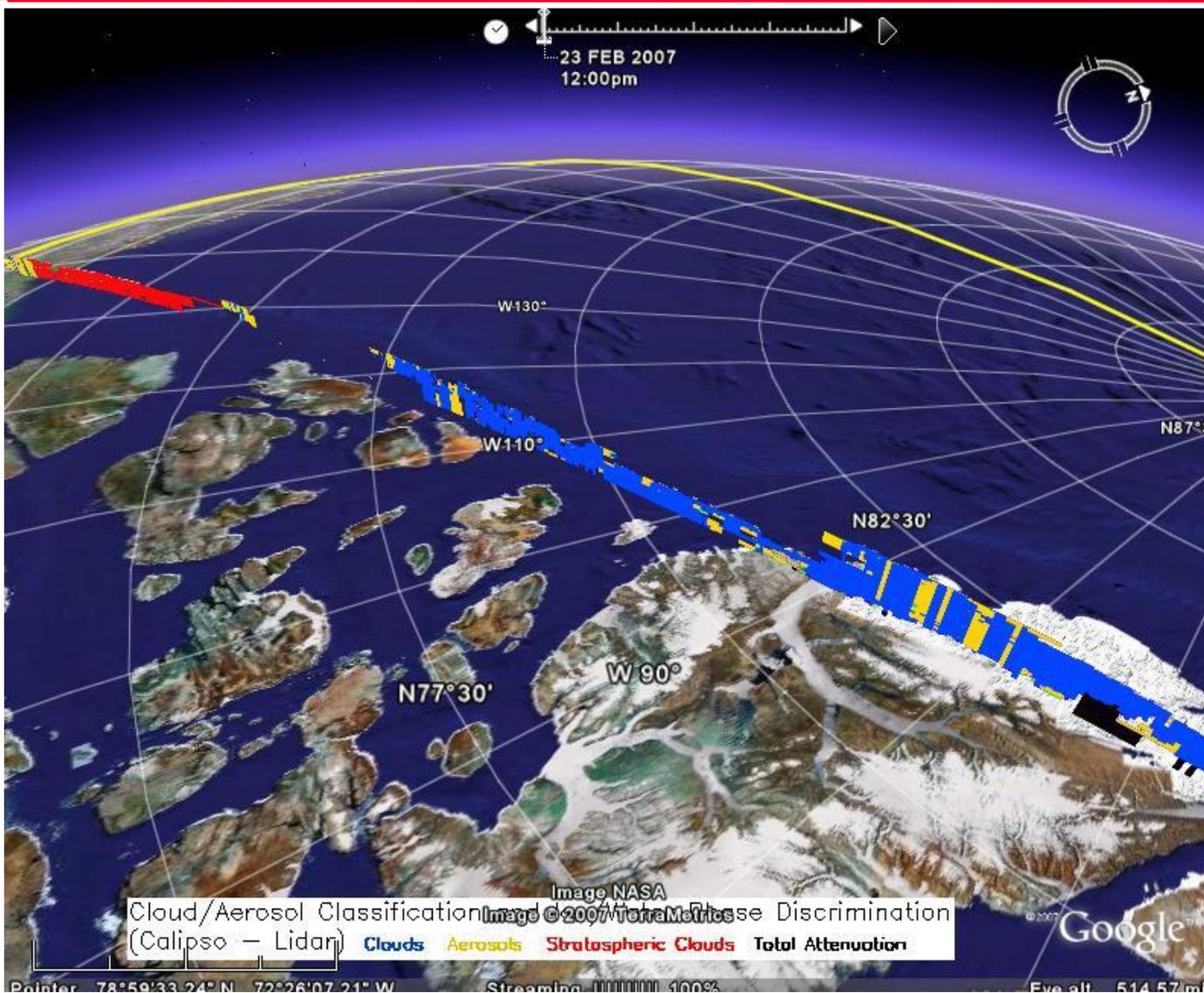
CloudSat data in GE



NASA/GMU CSISS



CALIPSO data in GE -1

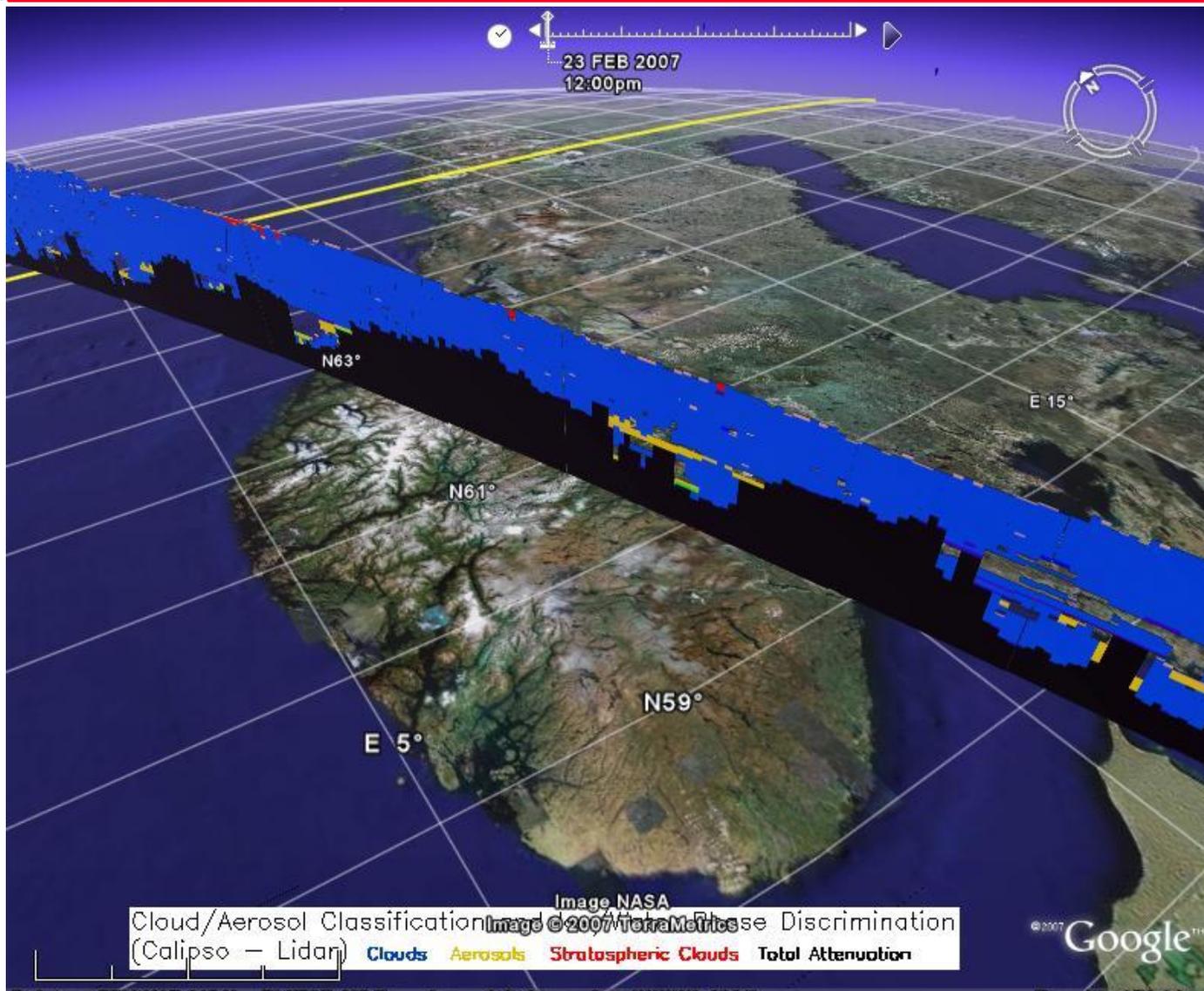


2007-02-23
12:00:00

Cloud/Aerosol
Classification
& Ice Water
Phase
Discrimination
from
CALIPSO



CALIPSO data in GE -2

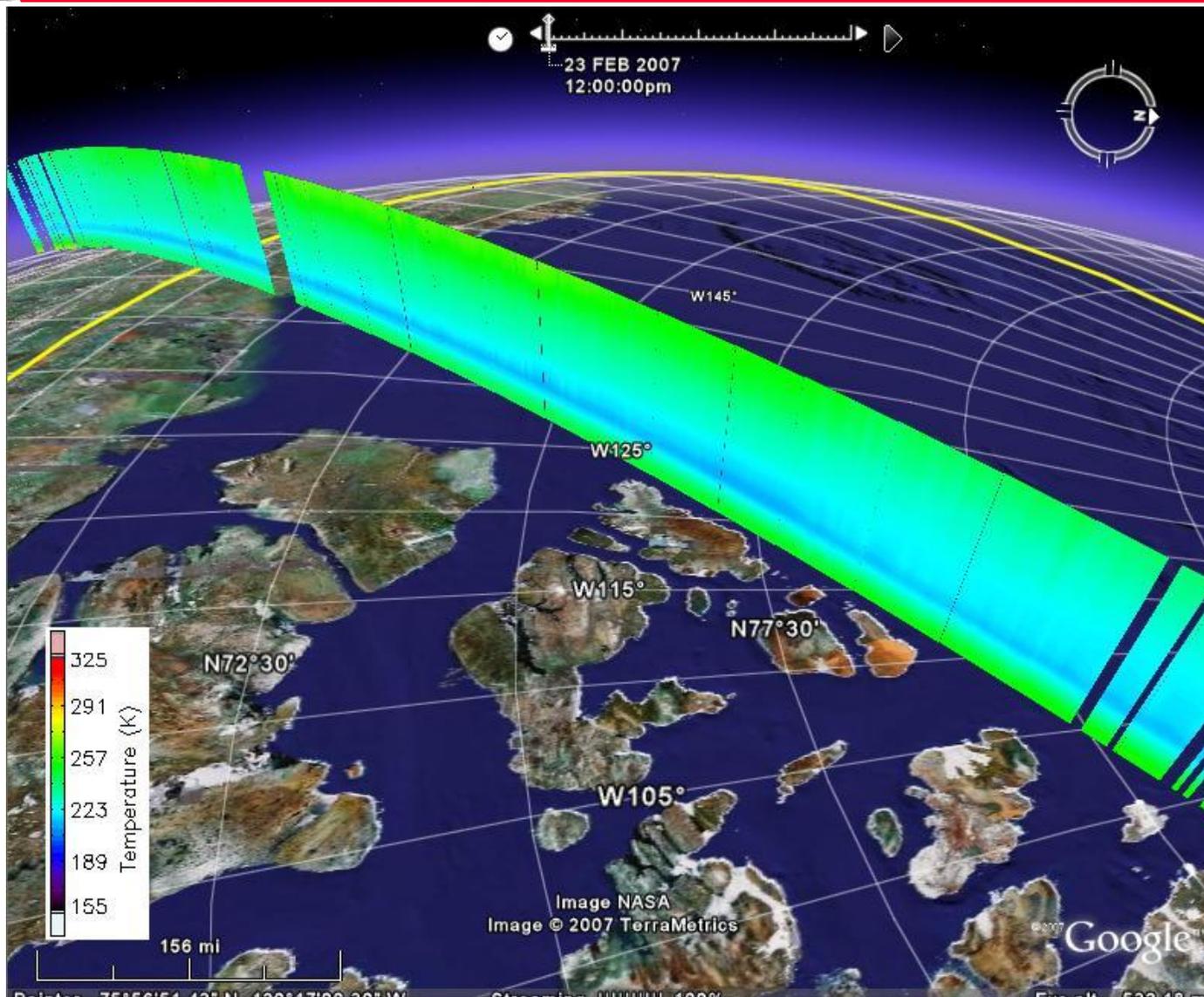


2007-02-23
12:00:00

Cloud/Aerosol
Classification
& Ice Water
Phase
Discrimination
from
CALIPSO



MODIS data in GE

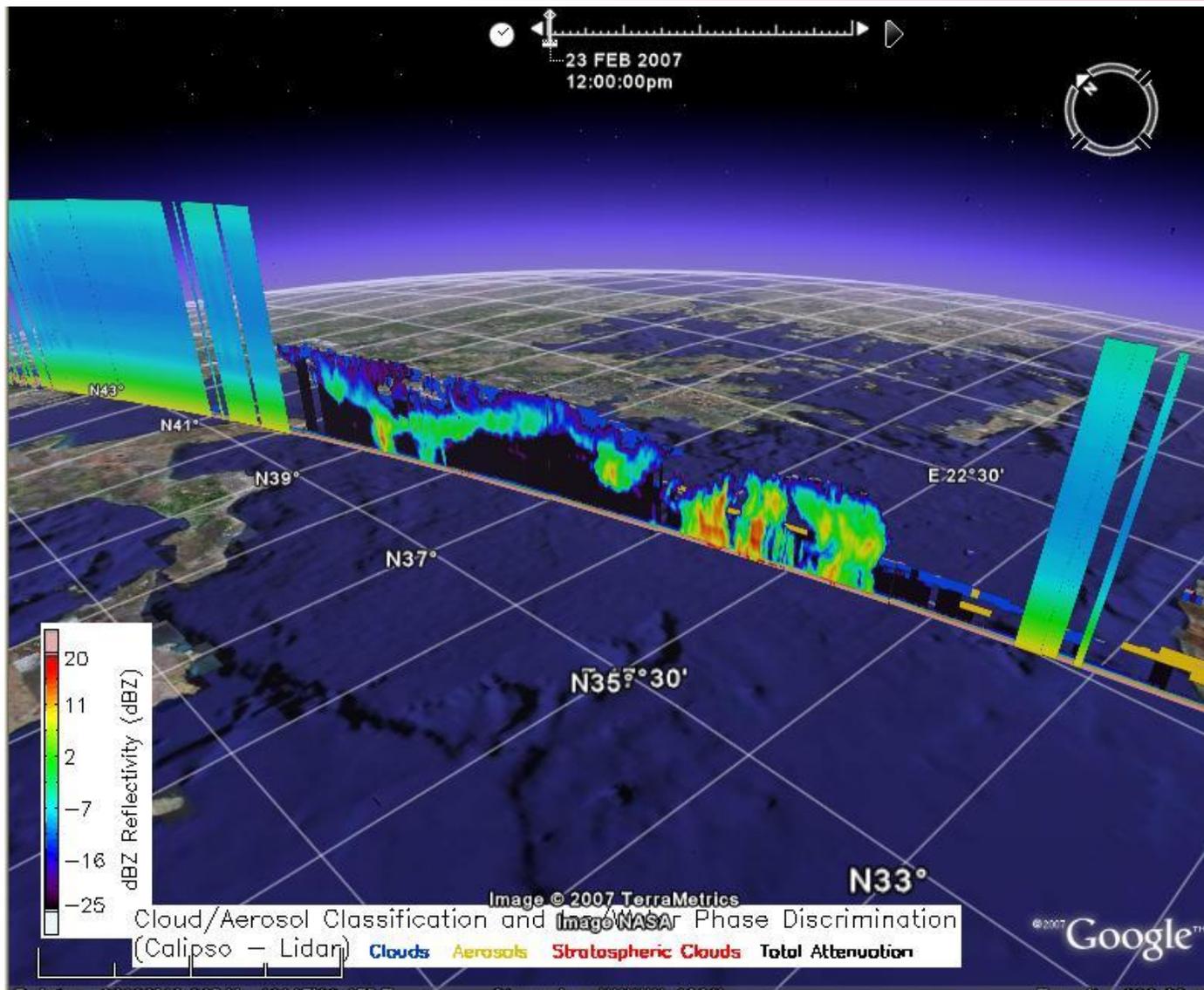


2007-02-23
12:00:00

Atmospheric
Temperature profile
from MODIS Aqua



CloudSat & CALIPSO & MODIS data in GE



2007-02-23

12:00:00

Cloud Reflectivity (dBZ) from 1B-CPR

AND

Cloud/Aerosol Classification & Ice Water Phase Discrimination from CALIPSO

AND

Atmospheric Temperature profile from MODIS Aqua

NASA/GMU CSISS



AIRS KMZ in WHOM



http://disc1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=atrain

NASA National Aeronautics and Space Administration Search
+ Advance

Giovanni - The Bridge Between Science and Data

+ ABOUT GIOVANNI + NEWS + INSTANCES + FEEDBACK + RELEASE NOTES

A-Train Along CloudSat Track Instance

CloudSat, and coregistered MODIS/Aqua, AIRS/Aqua, CALIPSO lidar, and OMI/Aura Atmospheric Measurements

[Product Lineage](#) | [Download Data](#)

Download source data products and data products derived from Giovanni processing stages. For simplicity purposes, only the initial retrieval and final rendering phases are currently accessible for

Initial Data Retrieval

Data Product	Start Time	File Size	Download Files (HDF, netCDF, ASCII, KMZ)
1B_CPR.008 ↗	2008-03-08T17:20:18Z		↗ netCDF Unavailable Ascii Unavailable

* Available from an external site

Curtain Plot Renderer

Input Files:

1B_CPR.008	2008-03-08T17:20:18Z		netCDF Unavailable Ascii Unavailable
------------	----------------------	--	---

Output Files:

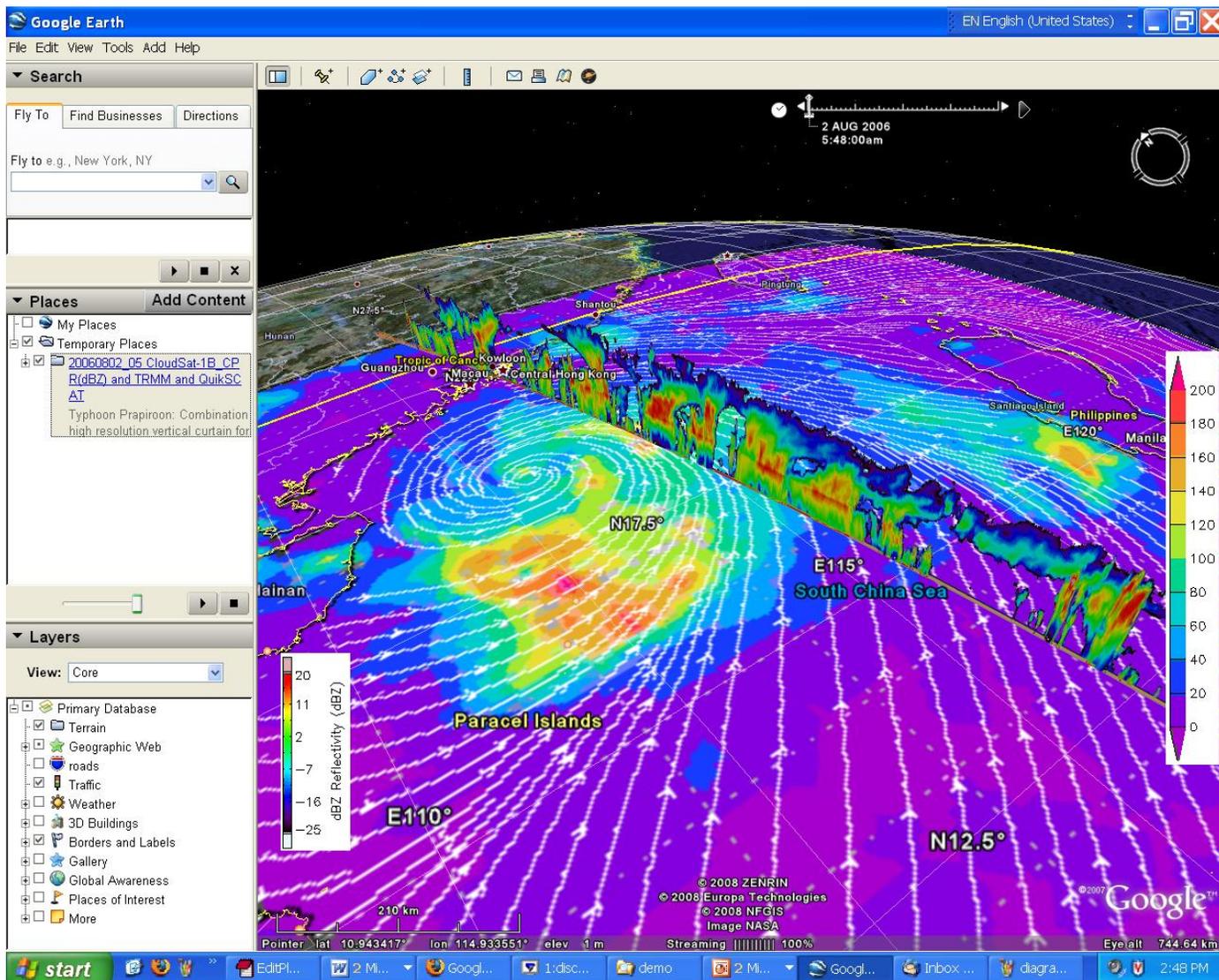
1B_CPR.008_dBZ.png			
CLD_track_map.png			

Responsible NASA Official: [Steven J Kempler@nasa.gov](mailto:Steven.J.Kempler@nasa.gov)
 Web Curator: [Stephen W Berrick <web-curator-disc@listserv.gsfc.nasa.gov>](mailto:Stephen.W.Berrick@web-curator-disc@listserv.gsfc.nasa.gov)

[+ Privacy Policy and Important Notices](#)



2D & 3D data in Google Earth

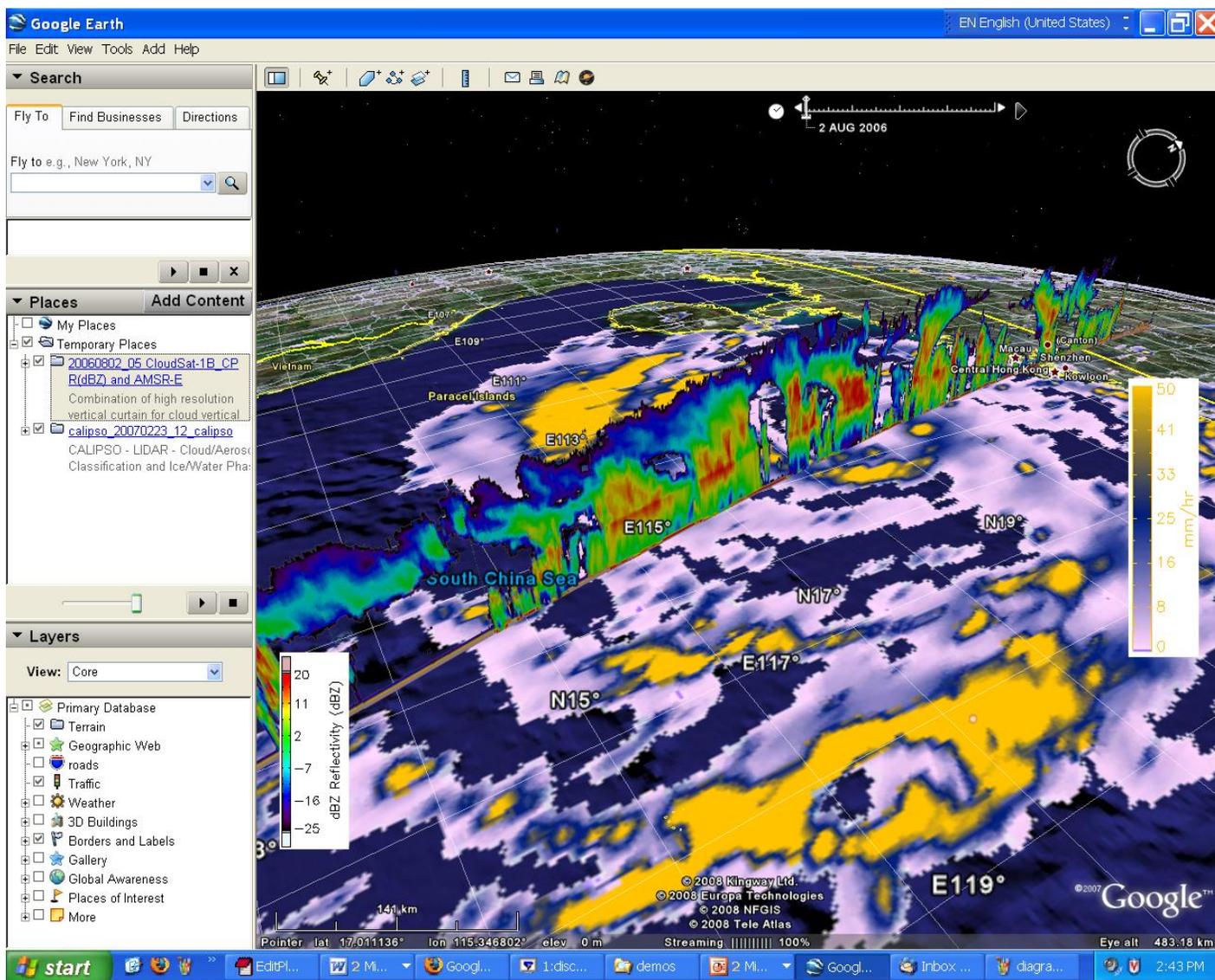


2006-08-02
5:48:00 – 5:--55:00

Vertical orbit
curtain describing
cloud vertical
structure (Radar
Reflectivity, dBZ)
derived from
CloudSat satellite,
and daily rainfall
(3B42) from
TRMM satellite,
and QuikSCAT
data for Typhoon
Prapiroon.



2D & 3D data in Google Earth

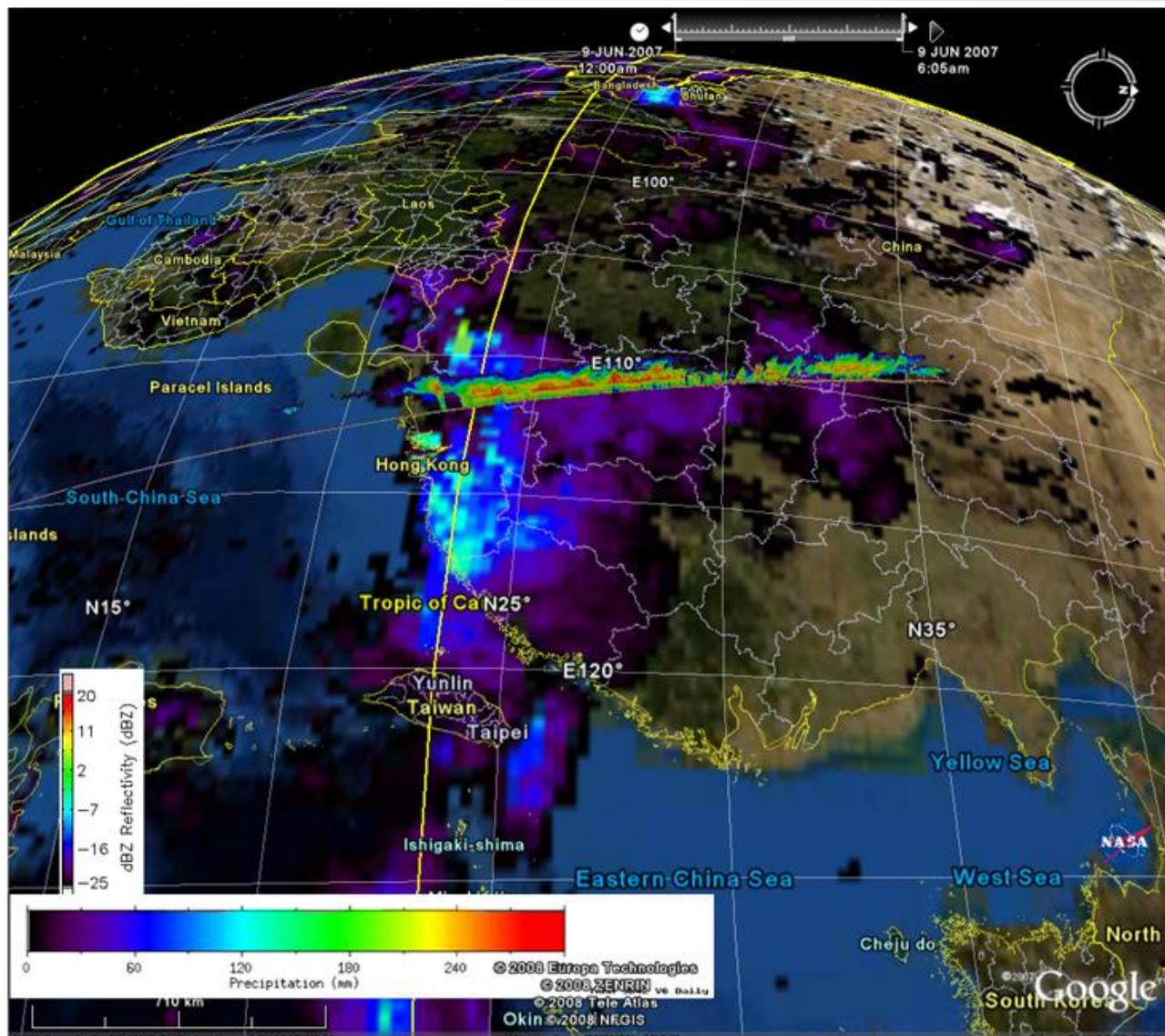


2006-08-02
5:48:00 – 5:--55:00

Vertical orbit
curtain describing
cloud vertical
structure (Radar
Reflectivity, dBZ)
derived from
CloudSat satellite,
and AMSR-E data
for Typhoon
Prapiroon.



Synergy of 2D & 3D data in GE -2



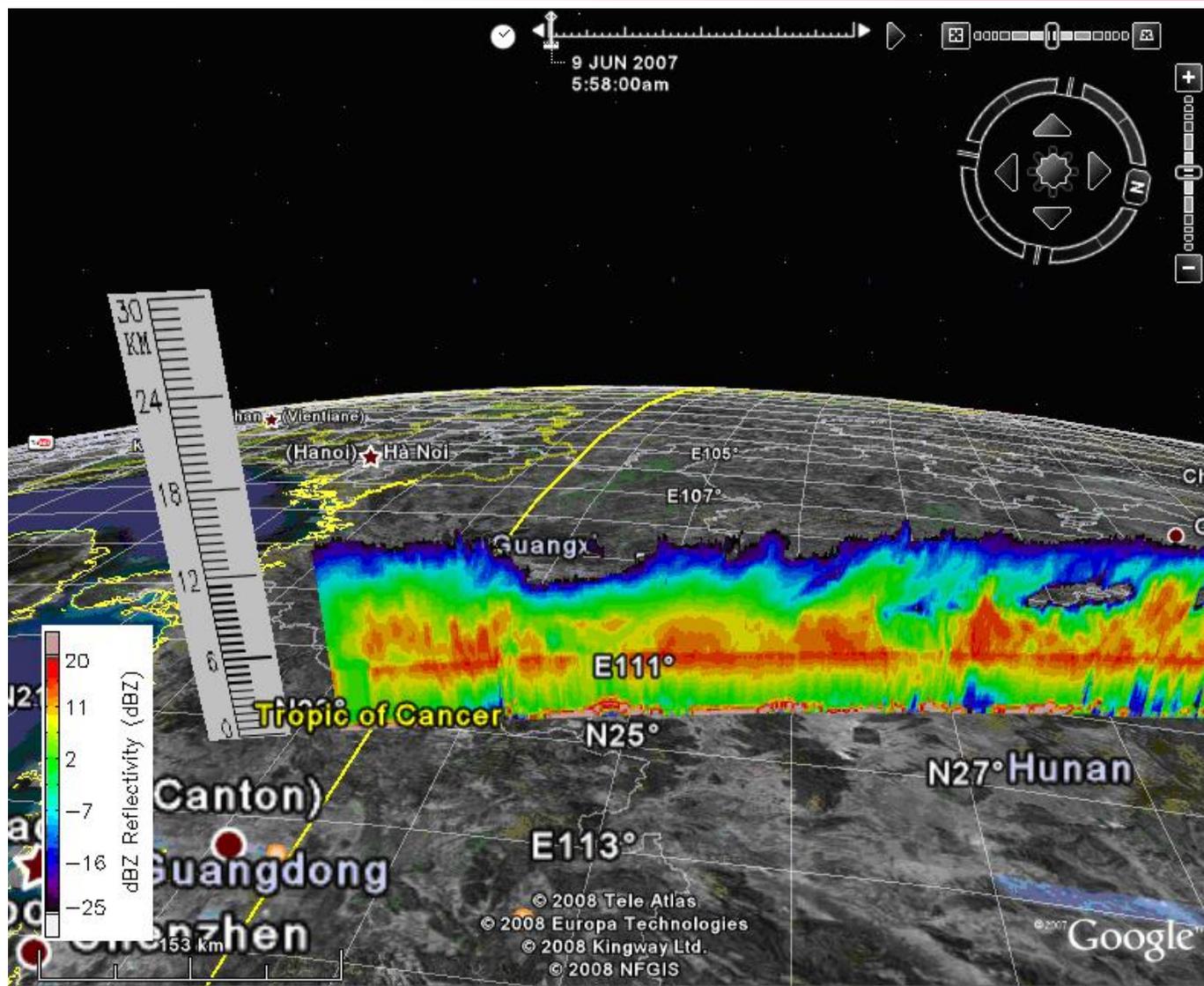
2007-06-09 GMT
12:00am - 6:05am

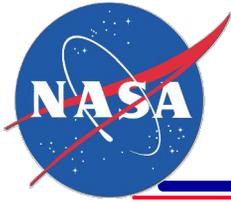
Vertical orbit
curtain describing
cloud vertical
structure (Radar
Reflectivity, dBZ)
derived from
CloudSat satellite,
and rainfall rate
from TRMM data
for Typhoon
Prapiroon.

NASA/GMU CSISS



Scale issue for Vertical Curtain – Scale bar





User Services at NASA GES DISC



Email: help-disc@listserv.gsfc.nasa.gov

Phone: 301-614-5224

URL: <http://disc.sci.gsfc.nasa.gov>

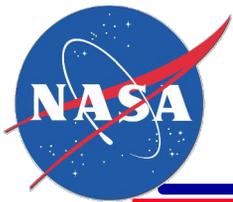
FAQ: http://disc.sci.gsfc.nasa.gov/faq/faq_contents.shtml

My Contact Information:

Email: Aijun.Chen@nasa.gov

Phone: 301-614-5152

Fax: 301-614-5268



Thank You for your attention !

Any Questions ?

Aijun.Chen@nasa.gov